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10/574,052	10/13/2006	Masayoshi Takahashi	B-5926PCT 623364-3	9788
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LADAS & PARRY				
5670 WILSHIRE BOULEVARD, SUITE 2100				
LOS ANGELES, CA 90036-5679				
EXAMINER				
STELLING, LUCAS A				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/574,052

Applicant(s)

TAKAHASHI ET AL.

Examiner

Lucas Stelling

Art Unit

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 December 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 10-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB-06)
Paper No(s)/Mail Date 3-29-06
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of species C, drawn to claims 10-13 in the reply filed on 12-09-09 is acknowledged. The traversal is on the ground(s) that all claims are directed to a unitary inventive concept. This is not found persuasive because although all claims share an independent claim, the species do not share a special technical feature as explained in the restriction requirement of 10-13-09.

The requirement is still deemed proper and is therefore made FINAL.

Accordingly, claims 7-9, and 14-17 are withdrawn as directed to a non-elected species.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-6 and 10-13 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims are generally narrative and indefinite, failing to conform with current U.S. practice. They appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors. The examiner recommends redrafting the claims, under examination, to positively recite the steps of the method of applicant's invention, and to otherwise comply with U.S. claim drafting practice.

4. Claim 1 recites the limitation "the step of microbubbles having a diameter of 50 μm or less ..." in lines 2-5. There is insufficient antecedent basis for this limitation in the claim.
5. Claim 1 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 1 recites a step of "decreasing gradually by natural dissolution of the gas contained in the microbubbles and disappearing finally," and also recites the limitation "the bubbles are disappeared by accelerating the speed of the microbubble size decrease by applying a stimulation to the microbubbles." These two limitations are inconsistent, and it is unclear whether the microbubbles disappear gradually or with accelerated speed.
6. Claim 2 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 2 recites the limitation "adiabatic compression-like change." A person having ordinary skill in the art would not know to a reasonable degree either alone, or in light of applicant's specification, whether any given change is "adiabatic compression-like," or not. Moreover, it is not clear whether the limitations of claim 2 relate to the step of allowing the bubbles to dissipate gradually and naturally, or to the stimulated disappearance, or both.
7. Claim 3 recites the limitation "the electric charge density" in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

8. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear whether the limitations of claim 3 relate to the step of allowing the bubbles to dissipate gradually and naturally, or to the stimulated disappearance, or both.

9. Regarding claim 4, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

10. Claim 4 recites the limitation "the substances present inside the microbubbles or in the area surrounding the microbubbles" in lines 1-4. There is insufficient antecedent basis for this limitation in the claim.

11. Claim 4 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear whether the limitations of claim 4 relate to the step of allowing the bubbles to dissipate gradually and naturally, or to the stimulated disappearance, or both.

12. Claim 5 recites the limitation "the chemical substances dissolved or floated in the solution" in lines 1-3. There is insufficient antecedent basis for this limitation in the claim.

13. Claim 5 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not clear whether the limitations of claim 5 relate to the

step of allowing the bubbles to dissipate gradually and naturally, or to the stimulated disappearance, or both.

14. Regarding claim 6, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention.

See MPEP § 2173.05(d).

15. Claim 10 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10 recites the limitation "when a circulation pipe is connected to a container..." It is unclear whether this is a conditional step of the method or whether it describes the structure used to carry out the method. Further, claim 10 recites the limitation "orifice or porous plate." It is unclear whether this limitation is drawn to --an orifice or a porous plate-- or --an orifice plate or a porous plate-- .

16. Claim 10 recites the limitation "the circulation pump" in line 6. There is insufficient antecedent basis for this limitation in the claim.

17. Claim 12 recites the limitation "the environmental pressure" in line 3. There is insufficient antecedent basis for this limitation in the claim.

18. Claim 12 recites the limitation "the intake side" in line 3. There is insufficient antecedent basis for this limitation in the claim.

19. Claim 13 recites the limitation "the container" in lines 2. There is insufficient antecedent basis for this limitation in the claim.

20. Claim 13 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

21. Claim 13 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 10 recites the limitation "when a circulation pipe is connected to the container..." It is unclear whether this is a conditional step of the method or whether it describes the structure used to carry out the method. Further, claim 13 recites the limitation "orifice or porous plate." It is unclear whether this limitation is drawn to --an orifice or a porous plate-- or --an orifice plate or a porous plate-- .

Claim Rejections - 35 USC § 103

22. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

23. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
24. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
25. Claims 1-6 and 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,221,260 to Chahine et al. ("Chahine") in view of "Effect of Shrinking Microbubble on Gas Hydrate Formation," Takahashi et al. ("Takahashi").
26. As to claims 1, Chahine teaches a method of producing a microbubble using a swirling fluid cavitating jet (**See Chahine col. 13 lines 20-40, and see col. 1 lines 43-59**), and in which a stimulation is provided to cause the rapid collapse of the bubble (**See col. 13 lines 22-30, the jet is directed towards a wall which initiates the collapse of the cavitation bubble**).
27. Chahine is different from claim 1 in that Chahine does not mention whether bubbles of less than 50µm are produced. Takahashi teaches the creation of microbubbles using a swirling fluid microbubble generator to produce microbubbles with a diameter distribution which includes microbubbles having a diameter of 50µm or less (**See Takahashi Figs. 1-3, and see page 2172, left column**). Furthermore, Takahashi

explains that the pressure inside the bubble is inversely proportional to the radius of the bubble **(See Takahashi page 2173)**. A person having ordinary skill in the art would have recognized the usefulness of producing small bubbles, below 50 μ m in order to produce a more energetic collapse. Moreover, Takehashi contemplates that smaller bubbles will have higher surface areas **(See Takahashi page 2171)**, and Chahine contemplates that the surface area of the cavities is an important factor in determining the production of hydroxyl radicals, and decontamination efficiency of the cavities **(See Chahine col. 6 lines 45-55)**. Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to operate Chahine to produce microbubbles having a diameter of 50 μ m or less, as the swirling jet is capable of producing bubbles of that size, and in order to produce higher pressures within the bubble which produces a more energetic collapse, as well as to maintain a large surface area for the cavities.

28. As to claim 2, Chahine and Takahashi teach the method of claim 1, and Chahine contemplates high temperature and pressure collapse of microbubbles in solution **(See col. 5 lines 60-68)**.

29. As to claim 3, Chahine and Takahashi teach the method of claim 1, and Chahine contemplates electric discharge, which is generated by bubble collapse, as well as the production of hydroxyl radicals **(See Chahine col. 5 line 65 -- col. 6 line 10, and see Chahine col. 6 lines 45-56)**

30. As to claim 4, Chahine and Takahashi teach the method of claim 1, and Chahine contemplates the creation of hydroxyl radical, which constitute an active oxygen species, which are used for decontamination **(See Chahine col. 45-55)**.

31. As to claim 5, Chahine and Takahashi teach the method of claim 1, and Chahine teaches using cavitation to eliminate organic and other contaminants from the liquids **(See Chahine col. 6 lines 1-10)**.

32. As to claim 6, Chahine and Takahashi teach the method of claim 1, and Chahine contemplates using cavitation to treat microorganisms **(See Chahine col. 15 lines 1-15)**.

33. As to claim 10, Chahine and Takahashi teach the method of claim 1, and Chahine contemplates producing cavitation within a nozzle chamber, and then expelling the cavitation pockets out of the nozzle chamber in an annulus of axially flowing liquid **(See e.g. Fig. 5 and col. 12 lines 30-45)**. Chahine goes on to explain that the cavitation nozzles are placed within a cavitation chamber which is connected to a recirculation pipe and pump **(See Figs. 8 and 9 and col. 13 line 56 -- col. 14 line 40)**. Chahine further provides plates, or walls, for causing the collapse of the bubbles **(Chahine col. 13 lines 35-40)**, and further specifies that the plates or walls contain orifices **(See Chahine col. 13 lines 40-42)**. But, Chahine does not specifically mention having the plate w/ orifices installed in the circulation pipe. Nonetheless, Chahine explains that when the swirling vortex with cavitation pockets is sheathed in an annulus of axially flowing liquid, that placement of the collapse inducing surface can be placed farther away from the nozzle outlet in order to extend the time in which cavitation is present

while still advantageously causing violent collapse of the cavitation pockets (**See Chahine col. 13 lines 50-56**). Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to place the collapse inducing surface in the recirculation pipe downstream of the nozzle exit in order to increase the time in which cavitation is present, while still producing violent bubble collapse.

34. As to claim 11, Chahine and Takahashi teach the method of claim 10, and Chahine contemplates pressurizing the system to 60 psi (**Chahine col. 14 lines 35-37**), which constitutes a pressure of 0.41 MPa.

35. As to claim 12, Chahine and Takahashi teach the method of claim 10, and Chahine teaches that the system is operable at atmospheric pressures (**See Chahine col. 14 lines 30-35**). Therefore, in order to draw liquid in the negative pressure at the intake side of the pump would be less than the atmospheric pressure.

36. As to claim 13, Chahine and Takahasi teach the method of claim 1, and Chahine contemplates producing cavitation within a nozzle chamber, and then expelling the cavitation pockets out of the nozzle chamber in an annulus of axially flowing liquid (**See e.g. Fig. 5 and col. 12 lines 30-45**). Chahine goes on to explain that the cavitation nozzles are placed within a cavitation chamber which is connected to a recirculation pipe (**See Figs. 8 and 9 and col. 13 line 56 -- col. 14 line 40**). Chahine further provides plates, or walls, for causing the collapse of the bubbles (**Chahine col. 13 lines 35-40**), and further specifies that the plates or walls contain orifices (**See Chahine col. 13 lines 40-42**). But, Chahine does not specifically mention having the plate w/ orifices installed in the circulation pipe. Nonetheless, Chahine explains that when the swirling

vortex with cavitation pockets is sheathed in an annulus of axially flowing liquid, that placement of the collapse inducing surface can be placed farther away from the nozzle outlet in order to extend the time in which cavitation is present while still advantageously causing violent collapse of the cavitation pockets (**See Chahine col. 13 lines 50-56**). Therefore, it would have been obvious to a person having ordinary skill in the art at the time of invention to place the collapse-inducing surface in the recirculation pipe downstream of the nozzle exit in order to increase the time in which cavitation is present, while still producing violent bubble collapse.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lucas Stelling whose telephone number is (571)270-3725. The examiner can normally be reached on Monday through Thursday 12:00PM to 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

las 2-18-10

/Matthew O Savage/
Primary Examiner, Art Unit 1797